

Claims

We claim:

1. A method of decoding a video signal including a base layer and a plurality of enhancement layers, said method comprising the steps of:
 - decoding said base layer to produce video frames;
 - decoding at least one of said enhancement layers to produce quality enhanced video frames;
 - combining said base layer video frames and said quality enhanced video frames to produce a first output;
 - upsampling said base layer video frames and a select number of said quality enhanced video frames;
 - decoding at least a second one of said enhancement layers to produce spatial enhanced video frames;
 - combining said spatial enhanced video frames and said upsampled video frames to produce a second output.

2. The method as recited in claim 1 further comprising the steps of
 - decoding at least a third one of said enhancement layers to produce temporal enhanced video frames; and
 - combining said decoded third enhancement layer frames and said spatial enhanced video frames to produce a third output.

3. The method as recited in claim 1 further comprising the steps of:
 decoding said base layer to produce motion compensated video frames; and
 combining said base layer video frames with said motion compensated video frames.
4. The method as recited in claim 3 further comprising the steps of:
 decoding said temporal layer to produce motion compensated temporal layer frames; and
 combining said temporal layer frames with said motion compensated temporal layer frames to produce a fourth output.
5. The method as recited in claim 1 further comprising the steps of:
 multiplexing selected ones of said outputs to produce a combined output.
6. A memory medium for decoding a video signal including a base layer and a plurality of enhancement layers comprising:
 code to decode said base layer to produce video frames;
 code to decode at least one of said enhancement layers to produce quality enhanced video frames;
 code to combine said base layer video frames and said quality enhanced video frames to produce a first output;
 code to upscale said base layer video frames and said quality enhanced video frames;

code to decode a second one of said enhancement layers to produce spatial enhanced video frames;

code to combine said enhancement layer video frames to said combined base layer and quality layer video frames to produce a second output.

7. The memory medium as recited in claim 6 further including:

code to decode a third one of said enhancement layers to produce temporal enhanced video frames;

code to combine said third enhancement layer video frames to said base layer video frames to produce a third output.

8. The memory medium as recited in claim 6 further including:

code for decoding said base layer to produce motion compensated video frames;
and

code for combining said base layer video frames with said motion compensated video frames.

9. The memory medium as recited in claim 8 further including:

code for decoding said temporal layer to produce motion compensated temporal layer frames; and

code for combining said temporal layer frames with said motion compensated temporal layer frames.

10. The memory medium as recited in claim 6 further including:

code for multiplexing selected ones of said video frames to produce a combined output.

11. A decoding apparatus for decoding a video signal including a base layer and a plurality of enhancement layers, said apparatus comprising:

means for decoding said base layer to produce video frames;

means for decoding at least one of said enhancement layer to produce quality enhanced video frames;

means for combining said base layer video frames and said quality enhanced video frames to produce a first output;

means for upscaling said base layer video frames and said quality enhanced video frames;

means for decoding a second one of said enhancement layers to produce spatial enhanced video frames;

means for combining said spatial enhanced video frames and said upscaled video frames to produce a second output.

12. The apparatus as recited in claim 11 further comprising:

means for decoding a third one of said enhancement layers to produce temporal enhanced video frames; and

means combining said decoded third enhancement layer frames and said spatial enhanced video frames to produce a third output.

13. The apparatus as recited in claim 11 further comprising:
means for decoding said base layer to produce motion compensated video frames;
and
means for combining said base layer video frames with said motion compensated video frames.
14. The apparatus as recited in claim 13 further comprising:
means for decoding said temporal layer to produce motion compensated temporal layer frames; and
means for combining said temporal layer frames with said motion compensated temporal layer frames to produce a fourth output.
15. The apparatus as recited in claim 11 further comprising:
means for multiplexing selected ones of said outputs.
16. The apparatus as recited in claim 11 further comprising:
means for demultiplexing said plurality of enhancement layers when said enhancement layers are multiplexed transmitted.
17. The apparatus as recited in claim 16 further comprising:
means for demultiplexing said base layer when said base layer is multiplexed transmitted.

18. A spatial decoder comprising:

a base layer decoder for receiving and decoding a FGS encoded base layer signal to produce base layer video frames;

a spatial layer decoder for receiving and decoding FGS encoded enhancement layer signals to produce enhancement layer video frames

a summer for combining said base layer video frames and a first one of said at least one enhancement layer video frames and producing a first output;

an upscaler for upscaling said combined base layer and first enhancement video frames; and

a second summer for combining said upscaled combined base layer and first enhancement video frames and a second one of said enhancement video frames to produce a second output.

19. The decoder as recited in claim 18 further comprising:

a third summer for combining said base layer video frames and a third one of said enhancement video frames to produce a third output.

20. The decoder as recited in claim 18 further comprising:

a fourth summer for combining motion compensated video frames in a selected enhancement layer with video frames of said selected enhancement layer to produce a fourth output.

21. The decoder as recited in claim 18 further comprising:
a multiplexer operable to multiplex selected ones of said outputs.
22. A system for decoding a spatially encoded FGS transmitted signal comprising:
a demultiplexer for sorting said transmitted signal into a base layer and
enhancement layer component signals; and
a spatial decoder comprising:
a base layer decoder for receiving and decoding a FGS encoded base layer
signal to produce base layer video frames;
a spatial layer decoder for receiving and decoding FGS encoded
enhancement layer signals to produce enhancement layer video frames
a summer for combining said base layer video frames and a first one of
said at least one enhancement layer video frames and producing a first output;
an upscaler for upscaling said combined base layer and first enhancement
video frames; and
a second summer for combining said upscaled combined base layer and
first enhancement video frames and a second one of said enhancement video frames to
produce a second output.
23. The system as recited in claim 22 wherein said decoder further comprises:
a third summer for combining said base layer video frames and a third one
of said enhancement video frames to produce a third output.

24. The system as recited in claim 23 wherein said decoder further comprises:
- a fourth summer for combining motion compensated video frames in a selected enhancement layer with video frames of said selected enhancement layer to produce a fourth output.
25. The system as recited in claim 22 further comprising:
- a multiplexer operable to multiplex selected ones of said outputs.